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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/473,569	12/29/1999	JEFFREY R. DAHN	55139-USA6-A	1140

32692 7590 10/07/2003

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EXAMINER	
DEB, ANJAN K	
ART UNIT	**PAPER NUMBER**
2858	

DATE MAILED: 10/07/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)
	09/473,569	DAHN ET AL.
	Examiner	Art Unit
	Anjan K Deb	2858

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *29 December 1999* .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-70* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-43,45-58 and 60-70* is/are rejected.

7)☒ Claim(s) *44 and 59* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *29 December 1999* is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) *4,6* .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Drawings

1. The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, the following are required to be shown in the drawing:

   - Calorimeter system coupled to processor, as in claim 39, must be shown or the feature(s) canceled from the claim(s). No new matter should be entered.
   - Medium, as in claim 70, comprising one or more magnetic data storage diskettes, direct access data storage disks, magnetic tape, alterable or non-alterable electronic read-only memory, flash memory, optical storage devices or signal-bearing media comprising digital, analog, and/or communication links and wireless transmission media or propagated signal media, must be shown or the feature(s) canceled from the claim(s). No new matter should be entered.

A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

3. Claims 1-3 are rejected under 35 U.S.C. 102(b) as being anticipated by MacNeil et al. (An Autocatalytic Mechanism for the Reaction of Li_xCoO_2 in Electrolyte at Elevated Temperature).

Re claim 1, MacNeil et al. discloses method of characterization of electrochemical cell (lithium-ion batteries) comprising preparing a sample of an electrode material (Li_xCoO_2) in contact with an electrolyte (see Title) obtaining self-heating data, power-temperature data (see Fig. 17) or power-time data, developing a power function, representative of thermal power per unit mass of the sample as a function of temperature and amount of reactant from a reaction of the electrode material and electrolyte of the sample (see equation 9 in page 977 and column 2 lines 3-20).

Re claim 2, MacNeil et al. discloses preparing a sample having 750 mg of electrode material (page 970 column 2, last para), which is less than 100 g.

Re claim 3, MacNeil et al. discloses preparing a sample having 750 mg of electrode material (page 970 column 2, last para), which is less than 1 and 10 g.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. Claims 4-7, 9-15, 17-19, 21-22, 26-27, 29-30, 41-43, 45-51, 53 are rejected under 35 U.S.C. 103(a) as being unpatentable over MacNeil et al. (An Autocatalytic Mechanism for the Reaction of Li_xCoO_2 in Electrolyte at Elevated Temperature).

Re claims 4, MacNeil et al. discloses all of the claimed limitations as set forth above except expressly disclosing preparing a sample having about 1 mg of electrode material.

At the time of the invention it would have been obvious for one of ordinary skill in the art to modify MacNeil et al. by adding only about 1 mg of electrode material to an electrolyte so as to use a minimum amount of electrode material for characterizing an electrochemical cell component (electrode).

Re claim 5, MacNeil et al. discloses cathode material (Li_xCoO_2).

Re claim 6, MacNeil et al. discloses anode electrode material (see abstract).

Re claim 7, MacNeil et al. discloses electrode material comprises Lithium (Li_xCoO_2).

Re claims 9-10, 17-18, MacNeil et al. discloses Accelerating Rate Calorimetry technique (ARC) and Differential Scanning Calorimetry (DSC)(page 970 column 1 last para, page 971 column 2 para 3).

Re claims 11, 41 MacNeil et al. discloses method of characterization of electrochemical cell (lithium-ion batteries) comprising preparing a first sample of cathode material (Li_xCoO_2) in contact with an electrolyte (see Title), obtaining self-heating data, power-temperature data (see Fig. 17) or power-time data of first, and developing first power function representative of thermal power per unit mass of the sample as a function of temperature and amount of reactant from a reaction of the electrode material and electrolyte of the sample (see equation 9 in page 977 and column 2 lines 3-20).

MacNeil et al. did not expressly disclose preparing a second sample of anode material in contact with electrolyte and developing a second power function but would have been obvious since MacNeil et al. discloses (see abstract) that similar models have developed previously for anode-electrolyte reactions.

At the time of the invention it would have been obvious for one of ordinary skill in the art to modify MacNeil et al. by adding second sample of anode material in contact with electrolyte and developing a second power function as disclosed by MacNeil (see abstract) for accurately predicting cell characteristics by taking into consideration both cathode and anode reactions with electrolyte.

Re claims 12-14, 45 MacNeil et al. discloses preparing a sample having 750 mg of cathode electrode material (page 970 column 2, last para), which is less than 100 g.

MacNeil et al. did not expressly disclose preparing a second sample of less than 100 g but would have been obvious in view of developing similar model for anode-electrolyte reactions (see abstract).

At the time of the invention it would have been obvious for one of ordinary skill in the art to modify MacNeil et al. by adding second sample of anode material having mass less than 100 g in contact with electrolyte for developing a second power function as disclosed by MacNeil (see abstract) for accurately predicting cell characteristics by taking into consideration both cathode and anode reactions with electrolyte.

Re claim 15, MacNeil et al. discloses cathode and anode material comprising Lithium (Lithium-ion batteries).

Re claim 19, MacNeil et al. discloses method of characterization of electrochemical cell (lithium-ion batteries) comprising defining one or more parameters of the electrochemical cell providing first power function representative of thermal power per unit mass of the sample as a function of temperature and amount of reactant from a reaction of the electrode material and electrolyte of the sample (see equation 9 in page 977 and column 2 lines 3-20). MacNeil et al. discloses prior-art "coupled with similar anode-electrolyte reactions" (see abstract).

MacNeil et al. did not expressly disclose providing a second power function.

At the time of the invention it would have been obvious for one of ordinary skill in the art to modify MacNeil et al. by adding second power function because MacNeil discloses performing similar models for anode-electrolyte reactions (see abstract) for accurately predicting cell characteristics.

Re claim 21, 26-27 MacNeil et al. discloses adjusting (changing) physical parameter (x of Li_x) of cell and predicting cell response using power function as shown in equation [9].

Re claims 22, 26 MacNeil et al. discloses defining one or more physical parameter (mass) (page 977 para 1-2).

Re claim 29-30, 53 MacNeil et al. disclose specified operating condition comprises a condition of a constant or varying current (20mA) applied to the cell (page 971, column 1 para 3).

Re claims 42, MacNeil et al. discloses modeling reactions assuming autocatalytic reaction mechanism (see Title).

Re claim 43, MacNeil et al. discloses the claimed equations [8][9].

Re claims 45-46, 48-51 MacNeil et al. discloses all of the claimed limitations as set forth above and including characterizing reaction between electrode material and electrolyte in terms

of thermal power per unit mass of electrode material and predicting cell parameters (see equation 9 in page 977 and column 2 lines 3-20).

Re claim 47, MacNeil et al. did not expressly disclose preparing a sample having about 1 mg of electrode material.

At the time of the invention it would have been obvious for one of ordinary skill in the art to modify MacNeil et al. by adding only about 1 mg of electrode material to an electrolyte so as to use a minimum amount of electrode material for characterizing an electrochemical cell component (electrode).

6. Claims 8,16 are rejected under 35 U.S.C. 103(a) as being unpatentable over MacNeil et al. (An Autocatalytic Mechanism for the Reaction of Li_xCoO_2 in Electrolyte at Elevated Temperature) in view of Atkins (Physical Chemistry. Fifth Edition).

Re claims 8,16 MacNeil et al. discloses all of the claimed limitations as set forth above except expressly disclosing obtaining temperature vs time data substantially under adiabatic conditions but it would be necessary so that there is no loss of heat to the exterior.

Atkins discloses calorimetry technique for measuring temperature change under adiabatic conditions with an arrangement that ensures there is no loss of heat from calorimeter to the surroundings.

At the time of the invention it would have been obvious for one of ordinary skill in the art to modify MacNeil et al. by measuring adding measuring temperature change under adiabatic conditions for ensuring there is no loss of heat from calorimeter to the surroundings.

7. Claims 20, 23-25, 32-40, 56-58, 60-70 are rejected under 35 U.S.C. 103(a) as being unpatentable over MacNeil et al. (An Autocatalytic Mechanism for the Reaction of Li_xCoO_2 in Electrolyte at Elevated Temperature) in view of Tibbetts (US 5,587,257).

Re claims 20, 23-25, 32-40, 56-58, 60-70 MacNeil et al. discloses all of the claimed limitations as set forth above without expressly disclosing a computer interface.

Tibbetts discloses electrochemical testing of Lithium-ion cell using a computer interface (column 9 lines 4-10).

At the time of the invention it would have been obvious for one of ordinary skill in the art to modify MacNeil et al. by adding computer interface disclosed by Tibbetts for controlling current applied to an electrochemical cell and recording data.

8. Claims 28, 31, 52, 54-55 are rejected under 35 U.S.C. 103(a) as being unpatentable over MacNeil et al. (An Autocatalytic Mechanism for the Reaction of Li_xCoO_2 in Electrolyte at Elevated Temperature) in view of Richard et al. (Predicting electrical and thermal abuse behaviors of practical lithium-ion cells from accelerating rate calorimeter studies on small samples in electrolyte. Journal of Power Sources pages 135-142, published in 1999) discloses short-circuit current testing of cell (page 140 column 1, lines 12-40).

Re claims 28, 52 MacNeil et al. discloses all of the claimed limitations as set forth above except expressly disclosing operating conditions comprises a condition of constant or varying ambient temperature.

Richard et al. discloses test were conducted in an oven where temperature was varied from 20^0 C to 150^0 C (page 138, column 2 and Fig. 8).

At the time of the invention it would have been obvious for one of ordinary skill in the art to modify MacNeil et al. by adding varying temperature in oven disclosed by Richard et al. for obtaining cell heat transfer profile under different environmental conditions.

Re claims 31, 54-55 MacNeil et al. did not expressly disclose short-circuit condition in cell.

Richard et al. discloses short-circuit current testing of cell (page 140 column 1, lines 12-40).

At the time of the invention it would have been obvious for one of ordinary skill in the art to modify MacNeil et al. by adding applying short-circuit current condition to cell disclosed by Richard et al. for testing cell.

Allowable Subject Matter

9. Claims 44, 59 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Reasons for Indicating Allowable Subject Matter

10. The primary reason for allowance of claims 44, 59 is the inclusion of second power function, Pa, associated with anode-electrolyte reaction as a function of the amount of a parameter x_1 that represents an amount of type 1 lithium measured as x in Li_xC_6, and a parameter x_2 representing an amount of type 2 lithium, measured per six carbons, and a parameter x_3 representing an amount of type 3 lithium, measured per six carbons, and parameters x_{1o}, x_{2o}, and x_{3o} representing initial amounts of lithium after electrochemical discharge and before heating, and parameters E_1, and E_2 representing activation energies, and parameters γ_1 and γ_2 representing frequency factors, a constant of proportionality (f) that governs how fast the layer of reaction products on the surface of the carbon grows as type 1 lithium is converted to type 3 lithium, and H_1 and H_2 are the heat per gram of carbon due to changes $\Delta x_1 = -1$ and $\Delta x_2 = 1$, respectively.

Pertinent Art

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Spruijt (US 4,622,509) discloses battery thermal model for determining battery capacity (column 7 lines 1-36).

Laig-Hörstebrock (US 6,362,598 B2) discloses temperature and battery current dependent predictive model of battery power.

Contact Information

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Dr. Anjan K. Deb whose telephone number is (703) 305-5219. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, N. Le, can be reached at (703)-308-0750.

Any inquiry of a general nature or relating to the status of this application should be directed to the Group receptionist whose telephone numbers are (703)-308-0956 and (703)-305-4900.

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